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Mercury's environment under extreme solar conditions

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Mercury the innermost and least investigated planet of our Solar system raises questions regarding numerous aspects. Given its close distance to the Sun, its weak magnetic field plus its large eccentricity (huge differences between perihelion and aphelion) the planet becomes an extremely interesting object. With the interplanetary magnetic field and density being somewhat a magnitude larger at the Mercury orbit than at the Earth's it resides in an extremely varying solar wind surrounding with perturbations on all temporal and spatial time scales. Some 30 years ago the Mariner 10 spacecraft measurements revealed that Mercury does possess a magnetic field forming out an Earth-like though extremely small magnetosphere with a scaling factor of 7-8 regarding to the Earth. During extreme Solar conditions an enhanced dynamic pressure exerted by the solar wind onto the magnetosphere results in a back-pushing of the 'magnetic shield' allowing particles to directly hit the surface. This results in enhanced sputtering rates from the surface leading to a higher exosphere refilling rate. Such sudden enhancements on short timescales which cannot be explained by orbital reasons in certain exosphere elements were observed and are likely to be explained by the aforementioned effect. In this study we tried to conduct a statistical approach using plasma data taken from the HELIOS spacecrafts during their mission throughout the inner heliosphere. Trying to get to know how often with respect to Solar cycle such drastic events (extremely high dynamic pressure) occur an estimation is made how often Mercury is opposed to such conditions. We used hourly-averaged plasma data from the two HELIOS spacecrafts which were orbiting between 0.3 and 1 AU likewise residing in the Mercury orbit (between 0.31 to 0.47 AU). Extreme Solar events such as Coronal Mass Ejections (CMEs) or Solar Energetic Particle events (SEPs) are taken

into account too finally trying to evaluate which effect is the more dominant one. The output is an estimate of how often Mercury finds itself under such extreme enhanced conditions. This should serve as an input for exosphere refilling simulations.